Claims

1. Method of controlling a magnetic flux of an electromagnet with a relay pulling characteristic, determined by stable levels of values of a magnetic flux in a composite magnetic guide, which at least partially is composed of a magnetically hard material, by supplying control pulses of electric current into a winding of a magnetizing coil with a possibility of obtaining a holding force of a movable part of the magnetic guide, with at least one air gap, characterized in that the magnetically hard material is used which has an ability to maintain during a remagnetization at least two stable conditions of magnetization, and as controlling pulses of electric current two short duration pulses of opposite polarity are supplied into the winding of magnetization of the composite magnetic guide, wherein during the supply of the first pulse, closing of the magnetic circuit of the magnetic guide is provided and minimization of a magnetic resistance of the magnetic guide due to minimization of air gap of the magnetic guide with a subsequent maximization of the magnetic flux in the magnetic guide and its transfer into one of stable conditions, characterized by a maximum value of the magnetic flux in the magnetic guide which corresponds to energy of controlling pulse action, with a possibility of

staying of the composite magnetic guide of the electromagnet in the stable condition and providing a holding force til a supply of another controlling pulse of electric current of an opposite polarity whose energy characteristic in magnitude is sufficient for transfer of the magnetic guide into another stable condition which is characterized by another magnitude of the magnetic flux which corresponds to it, and another magnitude of the holding force which corresponds to it.

2. Method according to claim 1, characterized in that the supply of the first controlling current pulse into the winding of the magnetizing coil with a subsequent maximization of the magnetic flux in the composite magnetic guide is performed after the minimization of the air gap.

3. Method according to claim 1, characterized in that the supply of the first controlling current pulse into the winding of the magnetizing coil with a subsequent maximization of the magnetic flux in the composite magnetic guide is performed before minimization of the air gap.

4. Method according to claim 1, characterized in that the magnitude of the controlling magnetic flux in the composite magnetic guide of the electromagnet due to the first controlling pulse of electrocurrent in the winding of the magnetizing coil of the electromagnet before closing of the magnetic circuit of the magnetic guide is performed at a level of its optimal value which is necessary for generating a working pulling force of the electromagnet and it is maintained at this level until a magnetization of the material of the magnetic guide, and thereafter the electrical pulse voltage is removed from the winding of the magnetizing coil, while the holding force of the electromagnet is provided due to a "magnetic memory" of the material of the composite magnetic guide with the possibility of obtaining a holding force whose magnitude is

$F \leq 0.98\ F_{max}$, where F_{max} is a maximum value of the magnetic force generated by the winding of the magnetizing coil.

5. Method according to claim 1, characterized in that the necessary power of the controlling pulses with a possibility of providing the

required holding force of the electromagnet is provided due to change of parameters of the controlling pulses, selected from a set consisting of an amplitude of a pulse, its duration, its shape, and their combinations.

6. Method according to claim1 , characterized in that into the winding of the magnetizing coil a second controlling current pulse is supplied with a different energy characteristic when compared with a characteristic of the first controlling pulse, and a transition is provided of the magnetization of the magnetic guide into another stable condition which is characterized by a corresponding magnitude of a magnetic flux in the composite magnetic guide and a corresponding value of the holding force.

7. Method according to claim 6, characterized in that the transition of the magnetic guide into a stable condition characterized by the magnitude of the magnetic flux in the magnetic guide equal to zero is provided, by supplying into the winding of the magnetizing coil of a controlling

current pulse which provides a voltage of the magnetic field in the magnetic guide equal to coercitive force on a magnetizing curve and a corresponding magnitude of holding force.

8. Method according to claim 7, characterized in that one of the stable conditions of the composite magnetic guide is its initial condition which is characterized by a magnetic force whose magnitude is equal to an initial value and a holding force corresponding to it.

9. Method according to claim 7, characterized in that the power P_2 of the second controlling pulse of current of opposite polarity is 2-5 times lower than a power P_1 of the first controlling current pulse of a direct polarity and constitutes $P_1=(2\div5)P_2$.

10. Method according to claim 1, characterized in that the duration t1 of the first controlling pulse of electric current of the direct polarity in the winding of the magnetizing coil and correspondingly a magnetic flux in the composite magnetic guide of the electromagnet of direct polarity and t2 of the second controlling pulse of opposite polarity do not exceed a triple magnitude of a constant of time τ of a transitional process for a mass of a movable part of the magnetic guide, i.e. $t1 \leq 3\tau$ and $t2 \leq 3\tau$, wherein τ is a constant of time of the transition process.

11. Method according to claim 1, characterized in that as the first controlling current pulse, into the winding of the magnetizing coil a pulse is supplied in form of a set of periodically modulated pulses, whose amplitude and/or enveloping curve increase from a zero value.

12. Method according to claim 1, characterized in that as a second current pulse, into the winding of magnetizing coil a pulse is supplied

in form of a set of periodically modulating pulses whose amplitude and/or enveloping curve extinguish to a zero value.

13. Electromagnet of an electromagnetic drive of an executing device formed as at least one winding of magnetization on a composite magnetic guide with an immovable stator, a movable core and at least one air gap, wherein at least partially the magnetic guide is formed as an insert of a magnetically hard material with a possibility of controlling a magnetic flux in the magnetic guide by its remagnetization due to the supply of short duration current pulses of different polarity into the winding of magnetizing coil, characterized in that the magnetic guide is formed with a possibility of closing a magnetic flux with a minimization of the air gap due to reciprocating linear displacement of the core, wherein the stator is formed as a flat base with at least one insert of a magnetically hard material fixed on it, while the core is formed as a steel plate with at least two rods mounted on it by their ends.

14. Electromagnet according to claim 13, characterized in that it is additionally provided with a current breaker in the winding of the coil, formed as normally closed contacts which are connected in series in a circuit of power supply of the winding of the magnetizing coil and provided with a contact switch, wherein an opening located in a center of its base for passage of the contact switch, wherein the core is provided with a contact pusher which is fixed to the core and provided with at least one return spring.

15. Electromagnet according to claim 13, characterized in that the core is formed as a plate with a ⊓-like shape in a longitudinal cross-section, in which side rods are fixed with their ends, while the stator is formed as a bar provided with an insert of a magnetically hard material.

16. Electromagnet according to claim 13, characterized in that the magnetic guide is formed as two plates, at least two rods, and at least

one insert of a magnetically hard material, wherein the core is formed with a П-like shape with a longitudinal cross-section in form of one plate and two rods connected to it with their ends, while the stator is formed as a second plate with an insert composed of a magnetically hard material and fixed on it.

17. Electromagnet according to claim 13, characterized in that the magnetic guide is formed as two plates with at least one insert of a magnetically hard material connected to it and at least three rods connected by upper ends to a second plate so as to form a core with a Ш-like shape in a longitudinal cross-section with the possibility of closing of the magnetic circuit with minimization of an air gap.

18. Electromagnet according to claim 17, characterized in that the core is formed with a Ш-like shape in a longitudinal cross-section, wherein at least two magnetizing coils are located preferably on the rods of the core with the possibility of creating coordinated magnetic fluxes in the central rod.

19. Electromagnet according to claim 18, wherein the magnetic guide is additionally provided with a magnetizing coil located on a central rod of the core, and its winding is connected in coordination with the windings of the magnetizing coils located on the end rods.

20. Electromagnet according to claim 19, wherein the winding of one of the magnetizing coils is connected in opposition.

21. Electromagnet of an electromagnetic drive of an executing device formed as at least one magnetizing coil on a composite magnetic guide with a movable stator, an immovable core and at least one air gap, wherein at least partially the magnetic guide is formed as an insert of a magnetically hard material with a possibility of controlling a magnetic flux in the magnetic guide by its remagnetization due to supply of short duration current pulses having different polarities into the winding of the magnetizing coil, characterized in that the magnetic guide is formed with the possibility of closing the magnetic flux with

minimization of air gap due to reciprocating turning displacement of the core along an arc and includes a housing formed as a disc on which at least one magnetic system is placed and has a shape of the segment, preferably circular segment, in which a passage-slot is provided with coaxially located side walls arranged in a plane along an arc, preferably a circle, a magnetizing coil is located in the housing, and the core is located in the passage-slot and formed as a rod with a top and a return spring which has a shape of the slot with the possibility of a reciprocating displacement in it, wherein the insert of a magnetically hard material is located on the bottom of the passage-slot and fixed to its wall perpendicularly to the direction of displacement of the core and limiting its displacement.

22. Electromagnet of an electromagnetic drive of an executingdevice formed as at least one magnetizing coil on a composite magnetic guide with a movable stator, an immovable core and at least one air gap, wherein at least partially the magnetic guide is formed as an insert of a magnetically hard material with the possibility of controlling a magnetic flux in the magnetic guide by remagnetization of the magnetic guide due to supply of two short duration pulses of different

polarities into the winding of the magnetizing coil, characterized in that the magnetic guide is formed with the possibility of closing of a magnetic flux with minimization of an air gap due to the reciprocating linear displacement of the core relative to the stator, the stator is formed as a cup provided with at least one rod, whose part is composed of a magnetically hard material, and which has one end connected to a bottom of the cup and another free end formed in one plane with an end of a cylinder, wherein at least one of the magnetizing coils embraces the rod, and a core is located outside of the cup and formed as a plate with the possibility of closing of the magnetic circuit with minimization of the air gap due to the displacement of the core relative to the stator.

23. Electromagnet of claim 22, characterized in that as the core, structural elements of metal scrap and/or load are used.

24. Electromagnet of claim 22, wherein the magnetic guide is formed with the possibility of closing of the magnetic flux with minimization of air

gap due to rotary displacement of the core relative to the stator, the core is formed as a plate with the possibility of closing of the cup with a cover, formation of a volume-closed magnetically conductive construction "cup-cover" and with the possibility of changing a moment of friction force between the core and the stator.

25. Electromagnet of an electromagnetic drive of an executing device formed as at least one magnetizing coil of a composite magnetic guide with a movable stator, a movable core and at least one air gap, wherein at least partially magnetically guide is composed of an insert of a magnetically hard material with the possibility of controlling a magnetic flux in the magnetic guide by a remagnetization of the magnetic guide by supply of two short duration current pulses of different polarities into the winding of the magnetizing coil, characterized in that the magnetic guide is formed with the possibility of closing of the magnetic flux with minimization of air gap due to linear and/or rotary displacement of the core relative to the stator, wherein the stator of the magnetic guide is formed as a cup with a magnetizing coil coaxially located in its inner cavity, and with a bottom

composed of a magnetically hard material, while the core is formed as a cover of the cup connected to an end of the rod which is coaxially located in the inner cavity of the winding, wherein the magnetic guide is formed with a possibility of closing of the cup with the cover with a simultaneous touching of the free end of the rod with the bottom of the cup, and formation of a volume-closed magnetically conductive construction "cup-cover-rod-cup bottom" and a possibility of changing a moment of friction force between the core and the stator.

26. Electromagnet of claim 25, characterized in that the cup bottom is composed of a magnetically hard material with a layer of a magnetically soft material and an outer side of the cup with the possibility of increasing an area of cross-section of the cup bottom perpendicularly to the direction of the magnetic flux.

27. Electromagnet of claim 25, characterized in that the cup bottom is partially formed as an insert of a magnetically soft material.

28. Electromagnet of claim 25, characterized in that at least partially the walls of the cup are formed as an insert of a magnetically hard material.